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In re the application of: Yukihiisa TAKEUCHI, Tsutomu NANATAKI, Iwao OHWADA  
and Tomoya HORIUCHI

Ser. No.: 10/027,232

Group Art Unit: Not Assigned

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For: ELECTRON-EMITTING DEVICE AND FIELD EMISSION DISPLAY USING THE  
SAME

Box Missing Parts  
Assistant Commissioner for Patents  
Washington, DC 20231

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for Patents, Washington D.C. 20231 on April 22, 2002.

*Elizabeth A. VanAntwerp*  
Elizabeth A. VanAntwerp

PRELIMINARY AMENDMENT

Sir:

Prior to examination, Applicants wish to amend the subject application as follows:

**In the Specification:**

**Please replace paragraph [0038] with the rewritten paragraph:**

[0038] Figures 1A and 1B are diagrams showing a first embodiment of the electron-emitting element according to the present invention.

Figures 2A and 2B are diagrams showing a second embodiment of the electron-emitting element according to the present invention.

Figures 3A and 3B are diagrams showing a third embodiment of the electron-emitting element according to the present invention.

Figures 4A and 4B are diagrams showing a fourth embodiment of the electron-emitting element according to the present invention.

Figures 5A and 5B are diagrams showing a fifth embodiment of the electron-emitting element according to the present invention.

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Figures 6A and 6B are diagrams showing a sixth embodiment of the electron-emitting element according to the present invention.

Figures 7A and 7B are diagrams for explaining the operation of the electron-emitting element according to the present invention.

Figures 8A and 8B are diagrams for explaining the operation of the other electron-emitting element according to the present invention.

Figure 9 is a diagram showing an embodiment of the FED according to the present invention.

Figure 10 is a diagram showing the relation between the relative dielectric constant of the electron-emitting element according to the present invention and the applied voltage to the electron-emitting element.

Figure 11 is a diagram for explaining Figure 10.

Figure 12 is a diagram showing the relation between the slit width of the electron-emitting element according to the present invention and an applied voltage to the electron-emitting element.

Figures 13A and 13B are diagrams showing a seventh embodiment of the electron-emitting element according to the present invention.

Figures 14A and 14B are diagrams for explaining the operation of the electron-emitting element of Figures 13A and 13B.

Figures 15A and 15B are diagrams showing an eighth embodiment of the electron-emitting element according to the present invention.

Figures 16A and 16B are diagrams for explaining the operation of the electron-emitting element of Figures 15A and 15B.

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**In the Claims:**

**Please rewrite claims 3, 6, 8-11, 13-17, 20, 23, 25-28, and 30-35 as follows:**

3. (Amended) An electron-emitting element according to claim 1, further comprising a third electrode arranged at a certain space to said first and second electrodes, wherein space between said first and second electrodes and said third electrode is vacuum.

6. (Amended) An electron-emitting element according to claim 4, further comprising a third electrode arranged at a certain space to said first and second electrodes, wherein space between said first and second electrodes and said third electrode is vacuum.

8. (Amended) An electron-emitting element according to claim 3, further comprising:  
a voltage source for applying a direct offset voltage to said third electrode; and  
a resistor arranged in series between this voltage source and said third electrode.

9. (Amended) An electron-emitting element according to claim 1, wherein a pulse voltage is applied to said first electrode and a direct offset voltage is applied to said second electrode.

10. (Amended) An electron-emitting element according to claim 1, further comprising a capacitor arranged in series between said first electrode and said voltage source.

11. (Amended) An electron-emitting element according to claim 1, further comprising a fourth electrode formed on the other surface of said electric field applying portion and facing to said first electrode.

13. (Amended) An electron-emitting element according to claim 1, further comprising a resistor arranged in series between said second electrode and a direct offset voltage source.

14. (Amended) An electron-emitting element according to claim 1, wherein said electric field applying portion has the relative dielectric constant not less than 1000.

15. (Amended) An electron-emitting element according to claim 1, wherein said slit has a width of not more than 500 $\mu$ m.

16. (Amended) An electron-emitting element according to claim 1, wherein at least one of said first electrode and said second electrode has an angular part with an acute angle.

17. (Amended) An electron-emitting element according to claim 1, wherein said first electrode and said second electrode each have carbon nanotubes.

20. (Amended) A field emission display according to claim 18, wherein a third electrode is arranged on the opposite surface to a surface of each of said phosphors facing said first and second electrodes, and the space between said first and second electrodes and said phosphor is vacuum.

23. (Amended) A field emission display according to claim 21, wherein a third electrode is arranged on the opposite surface to a surface of each of said phosphors facing said first and second electrodes, and the space between said first and second electrodes and said phosphor is vacuum.

25. (Amended) A field emission display according to claim 20, wherein each of said electron-emitting elements comprises:

a voltage source for applying a direct offset voltage to said third electrode; and

a resistor arranged in series between this voltage source and said third electrode.

26. (Amended) A field emission display according to claim 18, wherein a pulse voltage is applied to said first electrode and a direct offset voltage is applied to said second electrode.

27. (Amended) A field emission display according to claim 18, wherein each of said electron-emitting elements further comprises a capacitor arranged in series between said first electrode and said voltage signal source.

28. (Amended) A field emission display according to claim 18, wherein each of said electron-emitting elements further comprises a fourth electrode being formed on the other surface of said electric field applying portion and opposite to said first electrode.

30. (Amended) A field emission display according to claim 18, wherein each of said electron-emitting elements further comprises a resistor arranged in series between said second electrode and said direct offset voltage source.

31. (Amended) A field emission display according to claim 18, wherein said electric field applying portion has the relative dielectric constant not less than 1000.

32. (Amended) A field emission display according to claim 18, wherein said slit has a width of not more than 500 $\mu$ m.

33. (Amended) A field emission display according to claim 18, wherein at least one of said first electrode and said second electrode has an angular part with an acute angle.

34. (Amended) A field emission display according to claim 18, wherein said first electrode and said second electrode each have carbon nanotubes.

35. (Amended) A field emission display according to claim 18, further comprising a substrate having a plurality of electron-emitting elements arranged in two dimensions and formed into one body with each other.

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**REMARKS**

Prior to examination, Applicants respectfully request entry of this Amendment in which the specification has been amended to correct minor informalities.

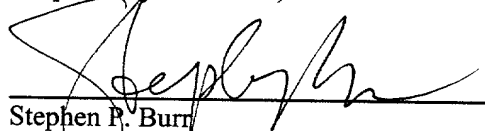
Claims 1-35 are pending herein. Applicants have amended the claims to eliminate multiple dependent claims. No new matter has been added. Applicants believe the case is now in condition for examination.

Attached hereto as pages 8-12 is a marked-up version of the changes made to the specification and claims by the current Amendment. The attached pages are captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

If the Examiner believes that contact with applicants' attorney would be advantageous toward the disposition of this case, he is herein requested to call applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

  
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Stephen P. Burr  
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April 22, 2002  
Date

SPB/eav

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the Specification:**

**Paragraph [0038] has been amended as follows:**

**[0038]** ~~Figure 1 is a diagram~~Figures 1A and 1B are diagrams showing a first embodiment of the electron-emitting element according to the present invention.

~~Figure 2 is a diagram~~Figures 2A and 2B are diagrams showing a second embodiment of the electron-emitting element according to the present invention.

~~Figure 3 is a diagram~~Figures 3A and 3B are diagrams showing a third embodiment of the electron-emitting element according to the present invention.

~~Figure 4 is a diagram~~Figures 4A and 4B are diagrams showing a fourth embodiment of the electron-emitting element according to the present invention.

~~Figure 5 is a diagram~~Figures 5A and 5B are diagrams showing a fifth embodiment of the electron-emitting element according to the present invention.

~~Figure 6 is a diagram~~Figures 6A and 6B are diagrams showing a sixth embodiment of the electron-emitting element according to the present invention.

~~Figure 7 is a diagram~~Figures 7A and 7B are diagrams for explaining the operation of the electron-emitting element according to the present invention.

~~Figure 8 is a diagram~~Figures 8A and 8B are diagrams for explaining the operation of the other electron-emitting element according to the present invention.

Figure 9 is a diagram showing an embodiment of the FED according to the present invention.

Figure 10 is a diagram showing the relation between the relative dielectric constant of the electron-emitting element according to the present invention and the applied voltage to the electron-emitting element.

Figure 11 is a diagram for explaining Figure 10.

Figure 12 is a diagram showing the relation between the slit width of the electron-emitting element according to the present invention and an applied voltage to the electron-emitting element.



**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

~~Figure 13 is a diagram~~ Figures 13A and 13B are diagrams showing a seventh embodiment of the electron-emitting element according to the present invention.

~~Figure 14 is a diagram~~ Figures 14A and 14B are diagrams for explaining the operation of the electron-emitting element of ~~Figure 13~~ Figures 13A and 13B.

~~Figure 15 is a diagram~~ Figures 15A and 15B are diagrams showing an eighth embodiment of the electron-emitting element according to the present invention.

~~Figure 16 is a diagram~~ Figures 16A and 16B are diagrams for explaining the operation of the electron-emitting element of ~~Figure 15~~ Figures 15A and 15B.

**In the Claims:**

**Claims 3, 6, 8-11, 13-17, 20, 23, 25-28, and 30-35 have been amended as follows:**

3. (Amended) An electron-emitting element according to claim 1 ~~or 2~~, further comprising a third electrode arranged at a certain space to said first and second electrodes, wherein space between said first and second electrodes and said third electrode is vacuum.

6. (Amended) An electron-emitting element according to claim 4 ~~or 5~~, further comprising a third electrode arranged at a certain space to said first and second electrodes, wherein space between said first and second electrodes and said third electrode is vacuum.

8. (Amended) An electron-emitting element according to ~~one of claims~~ claim 3, ~~6 and 7~~, further comprising:  
a voltage source for applying a direct offset voltage to said third electrode; and

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a resistor arranged in series between this voltage source and said third electrode.

9. (Amended) An electron-emitting element according to ~~one of claims~~ claim 1 to 8, wherein a pulse voltage is applied to said first electrode and a direct offset voltage is applied to said second electrode.

10. (Amended) An electron-emitting element according to ~~one of claims~~ claim 1 to 9, further comprising a capacitor arranged in series between said first electrode and said voltage source.

11. (Amended) An electron-emitting element according to ~~one of claims~~ claim 1 to 8, further comprising a fourth electrode formed on the other surface of said electric field applying portion and facing to said first electrode.

13. (Amended) An electron-emitting element according to ~~one of claims~~ claim 1 to 12, further comprising a resistor arranged in series between said second electrode and a direct offset voltage source.

14. (Amended) An electron-emitting element according to ~~one of claims~~ claim 1 to 13, wherein said electric field applying portion has the relative dielectric constant not less than 1000.

15. (Amended) An electron-emitting element according to ~~one of claims~~ claim 1 to 14, wherein said slit has ~~the~~ a width of not more than 500 $\mu$ m.

16. (Amended) An electron-emitting element according to ~~one of claims~~ claim 1 to 15, wherein at least one of said first electrode and said second electrode has an angular part with an acute angle.

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17. (Amended) An electron-emitting element according to ~~one of claims~~ claim 1 ~~to~~ 16, wherein said first electrode and said second electrode each have carbon nanotubes.

20. (Amended) A field emission display according to claim 18 ~~or~~ 19, wherein a third electrode is arranged on the opposite surface to a surface of each of said phosphors facing said first and second electrodes, and the space between said first and second electrodes and said phosphor is vacuum.

23. (Amended) A field emission display according to claim 21 ~~or~~ 22, wherein a third electrode is arranged on the opposite surface to a surface of each of said phosphors facing said first and second electrodes, and the space between said first and second electrodes and said phosphor is vacuum.

25. (Amended) A field emission display according to ~~one of claims~~ claim 20, ~~23 and 24,~~ wherein each of said electron-emitting elements comprises:  
a voltage source for applying a direct offset voltage to said third electrode; and  
a resistor arranged in series between this voltage source and said third electrode.

26. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to~~ 25, wherein a pulse voltage is applied to said first electrode and a direct offset voltage is applied to said second electrode.

27. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to~~ 26, wherein each of said electron-emitting elements further comprises a capacitor arranged in series between said first electrode and said voltage signal source.

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28. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to 26~~, wherein each of said electron-emitting elements further comprises a fourth electrode being formed on the other surface of said electric field applying portion and opposite to said first electrode.

30. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to 29~~, wherein each of said electron-emitting elements further comprises a resistor arranged in series between said second electrode and said direct offset voltage source.

31. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to 30~~, wherein said electric field applying portion has the relative dielectric constant not less than 1000.

32. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to 31~~, wherein said slit has ~~the~~ a width of not more than 500 $\mu$ m.

33. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to 32~~, wherein at least one of said first electrode and said second electrode has an angular part with an acute angle.

34. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to 33~~, wherein said first electrode and said second electrode each have carbon nanotubes.

35. (Amended) A field emission display according to ~~one of claims~~ claim 18 ~~to 34~~, further comprising a substrate having a plurality of electron-emitting elements arranged in two dimensions and formed into one body with each other.